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References

Immer, F. R. and M. T. Henderson. 1943. Linkage studies in barley. Genetics 28:419-440.

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1. Inheritance of magenta flower color.

In an increase plot of foundation seeds of Harosoy in 1957 at Urbana, a number of Harosoy-type plants were found with flowers of a deeper red than the normal purple (P). The color is best described as magenta (M). This mutant was added to the Genetic Type Collection as T235. Results were obtained at Urbana which indicated that a single recessive gene, wm, was involved. It was not allelic to $\underline{W}_1$. The F_1 of T235 (M) x Harosoy (P) was purple and the F_2 segregated 128P : 56M; F_3 progeny tests showed that 12 purple F_2 plants produced only P, 44 purple segregated P and M (1174 : 384 in total), and 29 magenta gave only M. The F_1 of C1128 (white, W) x T235 (M) was purple and the F_2 segregated 154P : 64M : 93W.

In conjunction with a leaf-flavonoid study (Buttery and Buzzell, 1973) at Harrow we observed that, in comparison to Harosoy, the amount of the leaf-flavonol glycosides K1, K2, and K5 was greatly reduced in T235. Fuming the flowers of T235 with ammonia indicated that there was a reduction in flavonol content, i.e. they had blue standards and cream-colored wings in contrast to green standards and yellowish wings for purple flowers, and bright yellow standards and wings for white flowers. From the cross of E. E. Hartwig's "New white" strain x T235, white-flowered plants with reduced leaf flavonol content were obtained that upon fuming gave only a slight change from white to a dull cream color. The wm gene was not allelic to $\underline{W}_4$.

By using leaf-flavonol tests and fuming tests of flowers, the F_2 of W x M crosses should be separable into four classes as follows:

Genotypes	Expected ratio	Flower color	Flavonol content of leaves & flowers
$\underline{W_1}$ - $\underline{Wm}$ -	9	Purple	Normal (N)
$\underline{W_1}$ - $\underline{wmwm}$	3	Magenta	Reduced (R)
$\underline{w_1w_1}$ $\underline{Wm}$ -	3	White	Normal (N)
$\underline{w_1w_1}$ $\underline{wmwm}$	1	White	Reduced (R)

The white-flowered L62-904 (backcross strain of Harosoy) was crossed with T235; i.e., $\underline{w_1w_1WmWm}$ x $\underline{W_1W_1wmwm}$. The F_2 segregated 47P : 24M : 25 W-N : 0 W-R whereas 54 : 18 : 18 : 6 were expected for a 9 : 3 : 3 : 1 ratio with independent segregation. In the F_3 of the purple F_2 plants, 40 segregated P, M, and W (N or R?), 3 segregated P and M, and 4 segregated P and W (N or R). All progenies of magenta plants were magenta. Fuming tests of the F_3 of the 25 white-flowered F_2 plants revealed that 5 were segregating W-N : W-R (in total 66 : 23 plants). These results were confirmed by leaf-flavonol tests. Thus, $\underline{wm}$ is linked with $\underline{W_1}$ (recombination estimated to be 11%). Since there is no known linkage involving $\underline{W_1}$, this could be a new linkage group. Additional tests are being run with larger populations.

The fact that the magenta characteristic does not occur in commercial and introduced varieties indicates that it might be a deleterious mutant. Magenta-flowered plants often develop a distinctive reddish-purple discoloration of the leaves as the plants approach maturity. In the U.S. Regional Soybean Tests, magenta isolines averaged 3% less in yield than the corresponding purple-flowered Harosoy. In a field test at Harrow, T235 had a lower photosynthetic rate and lower specific leaf weight than Harosoy. The $\underline{w_1w_1}$ $\underline{wmwm}$ genotype will be tested to determine whether the observed effects are caused by a decrease in flavonols or an increase in cyanidins.

References

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